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Revisions to 89-6 (2nd Draft.)

L-107-99 (10-86)

SCL 05186

CTY0050199

SEA290676

Date: July 3, 1990

To: Mike Healy

From: Christy O'Quinn

Subject: Final Report - WO 89-6

After reviewing your revisions to the final report for Work Order 89-6 I have the following comments:

1. The graphics are fine, although I would like to see a draft of the "sampling map" for WO 90-6.

2. Ditto.

3. The wood core data and discussion are also fine.

4. I appreciate your effort to provide a better discussion of the PCB transport processes in the flume. However, this entire discussion is rather speculative and contains statements which, unless supported by evidence, are best left out. For example, the statement, "contaminated sediments were deposited in the flume," leaves one wondering where such sediments came from originally.

Please simply state that "The level of PCB contamination in the flume has decreased over time and Raven believes that this is due to tidal action and stormwater runoff which act to redistribute sediments along the flume." An other conclusion that could be derived from the monitoring data is that no additional PCBs are entering the flume.

Also, City Light is not asking for a recommendation regarding what action should be taken to resolve PCB contamination in the flume. Therefore, please delete the reference to cleaning the flume head. I have attached a copy of the relevant pages and marked my revisions on them. Please call me if you have any problem with these corrections.

Thank you for all the hard work.

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sediments by tidal action. ~~These processes seem to continue~~. The flume head sediment results show a decrease from 123 ppm in 1987 to 9.6 ppm in the latest sampling, as shown in Table III. ~~There appear to be few mechanisms for sediment removal in the flume head and the water above the sediments appears stagnant during dry periods. The data in Table III support an ongoing transport process to remove PCBs. A possible explanation is illustrated by the following scenario~~.

1. Contaminated sediments were deposited in the flume head between the 1985 cleanup period and the 1987 sampling period.

2. Contamination from the flume head slowly moved into the flume and appeared at concentrations of a few parts per million in 1988.

3. The PCBs in the flume head have decreased somewhat in two years due to rains.

4. The PCBs in the sediments of the flume near the tidegates have decreased. Three mechanisms are responsible: a) rainwater washing, b) reworking and washing of sediments by tidal action, and c) deposition of clean fill sand from Boeing landscape projects on the flume banks.

A logical hypothesis that arises from the above interpretation is that if the sediments in the flume head were removed, then the flume would purge itself of sediments containing traces of PCBs. Raven would recommend cleaning the flume head unless other construction plans would make the cleaning unnecessary.

The wood core sample collection was begun in 1984 (Work Order #84-6). A sample one-foot upstream of the tide gates contained 1.7 ppm Aroclor 1242. A sample downstream of Myrtle St. contained <0.1 ppm. All the recent wood core data are presented in Table I and are at concentrations below a few parts per million. ~~The presence of PCBs in the wood planks may be regarded as more permanent contamination. Washing by rainwater and tidewater would~~

~~have much less effect on PCBs inside the planks than on PCBs in the~~ sediments.

2200 Sixth Avenue, Suite 519, Seattle, Washington 98121 • (206) 443-1126

July 2, 1990

Ms. Christy O'Quinn
Environmental Affairs Division
Seattle City Light
1015 Third Avenue
Seattle, Washington 98104

Dear Christy:

Enclosed is a copy of the final report or Work Order #89-6. We are sending one copy rather than five because so many changes have occurred since the draft. We will send the final five copies as soon as you request them. The changes are as listed.

1. The graphic are in a transitional stage here. The Work Order #90-6 report will have a vicinity map and flume map. This report has a vicinity map, a site (flume) map, and a sampling map.

2. The Methods section for 1990 reports has undergone revisions. Those revisions are not in this report. This report is as you edited it.

3. The discussion of the PCB transport processes in the flume has been completely rewritten.

4. All wood core data were fit onto Table I. The wood core discussion was completely rewritten.

Since this report is transitional, it still retains a few archaic characteristics to its format that will be changed for the report for W.O. #90-6. Please FAX any changes in this copy and we will send the new original and five copies right afterward.

Sincerely yours,

Mike

Michael L. Healy, Ph.D.
Research Manager

MLH/sc

SCL 05190

SEATTLE CITY LIGHT WORK ORDER #89-6

1989 MONITORING OF THE GEORGETOWN FLUME

RAVEN SERVICES CORPORATION
2200 SIXTH AVENUE, SUITE 519
SEATTLE, WASHINGTON 98121
(206) 443-1126; FAX (206) 443-1128

June 29, 1990

SCL 05191

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SEATTLE CITY LIGHT WORK ORDER #89-6

1989 MONITORING OF THE GEORGETOWN FLUME

I. INTRODUCTION

The Georgetown Steam Plant Flume was cleaned in November 1985. In March 1987, the Boeing Company was given a 90-day notice of cancellation of its permit to dispose process cooling water into the flume. The permit was revoked by City Light on May 22. In April 1987, Raven Services Corporation undertook a project authorized by Seattle City Light Work Order #87-5 to determine the extent of polychlorinated biphenyl oil contamination in the Georgetown Steam Plant drainage ditch and flume to determine if any contaminants had reentered the system. Results of the 1987 study indicated that some recontamination of the flume system had occurred. Documentation and chronology of the recontamination of the flume system was presented in the report for Work Order #87-10, page 16. The Boeing Company subsequently sealed the storm drain spouts and cooling water plumbing that discharged into the flume. Additional flume monitoring occurred in July 1988, as authorized by Seattle City Light Work Order #88-12, to reassess the extent of PCB contamination. Quarterly monitoring in 1989 is authorized by the present work order. The monitoring in April is covered in the June report for present work order (#89-6). The spring monitoring was cancelled until the rainy season returned. The autumn monitoring (beginning of rains) took place on 19 September, and is described in the autumn report. The winter monitoring of 23 December and the summary are reported here.

II. SAMPLING METHODOLOGY

A. Container and Sampling Equipment

All samples were placed in pre-cleaned, 30 ml wide-mouth glass containers. Screw cap lids were lined with aluminum foil. The precleaning procedure involved scrubbing with a special petrochemical dissolving soap [HarborMaster Products, Inc., Edmonds, Washington]. The terminal end of the brush applied had sufficient bristles to scrub the seam where the side connects with the bottom. A final rinsing with methylene chloride was undertaken to remove any invisible greases and detergent residues.

Scoops and collection pans were laboratory grade stainless steel. Before use, all tools were buffed free of rust, cleaned with petrochemical dissolving soap, and rinsed with methylene chloride.

B. Field Observations

Data on the collection process and observations of the physical nature of the samples were kept in the bound field log book. The format for this book is chronological.

C. Sampling Strategy

In accordance with EPA SW-846, "Test Methods for Evaluating Solid Waste," a sampling strategy was chosen from sections most analogous to the nature of the site. These sections were 1.4.3 and 1.4.4. Individual discretion was required to determine an appropriate sampling scheme for flume sediments. In addition, access to sampling areas is somewhat dependent upon where holes occur in the mesh covering at the top of the flume.

D. Sample Collection

Method 8080 in the EPA SW-846 manual describes the protocol for handling organochlorine pesticides and polychlorinated biphenyls. Compliance with these instructions necessitated using glass containers and specified conditions for refrigeration. All samples in our case were delivered to the laboratory in time to comply with the maximum seven days storage for extraction and thirty days for complete analysis.

The sediments were shallow, and since access to the sample sites was restricted by the wire heavy mesh across the top of the flume, a special device was used in the form of an 8 cm stainless steel spoon bent to a 90° angle and attached to a 1/2" diameter 7' long stainless steel pipe. The spoon was ferreted through holes in the mesh and used as a scoop against the floor of the flume. Compositing was accomplished in a stainless steel 30 cm diameter mixing bowl.

Wood cores were specified for this project. Raven has devised a corer that can sample any of the wood floor locations. The corer consists of a steel punch, 5/8" in diameter and nine feet long. Threads at the bottom of the punch allowed the corer to be screwed out from the planks after it had been hammered in. A slot was cut 2-1/2 inches above the bottom of the core nose to facilitate sample removal. The device resembles a giant leather punch. Sampling locations are shown in the Figure.

E. Analysis

Samples, stored no longer than five days at 4° C, were extracted with methylene chloride and taken up with pesticide grade hexane. Samples were pre-treated with Florisil filters to remove residues that interfere with the PCB determination [cleanup modification of USEPA Method 3540, as specified by 40CFR136]. The samples were analyzed by a modification of the packed column gas chromatography procedure described in Method 3550 using a capillary column. The automated gas chromatograph [Waters Corp Dimension-1] with electron capture detector was used. Concentrations below 0.01 ppm are below the detection limit, but concentrations below 1 ppm are difficult to quantify. QA/QC and raw signal data are available on request.

III. RESULTS

Temperatures, as recorded with the $\pm$0.05° C immersion thermometer, were air - 7.7° C, water in flume head - 7.4° C, water at double pipes head - 7.4° C. State of the tide was 7.0 ft. referenced to Seattle tides. The flume had been emptying of tidewater since noon. PCB results on Table I show that PCB residues remain in patches of the flume head system, where 9.6 ppm were found in the flume head sediment (composite of two) and 5.8 ppm were found at the head of the double pipes. Above the tidegates (composite of four subsamples), 0.8 ppm was detected. Below the tidegates the concentration was 0.4 ppm. The wood core samples below the tidegates were <0.1 and 1.4 ppm respectively.

IV. DISCUSSION

The decrease in PCB concentrations in the flume system over time has been attributed to washing of the sediments by rainfall and redistribution of the

sediments by tidal action. These processes seem to continue. The flume head sediment results show a decrease from 123 ppm in 1987 to 9.6 ppm in the latest sampling, as shown in Table III. There appear to be few mechanisms for sediment removal in the flume head and the water above the sediments appears stagnant during dry periods. The data in Table III support an ongoing transport process to remove PCBs. A possible explanation is illustrated by the following scenario.

1. Contaminated sediments were deposited in the flume head between the 1985 cleanup period and the 1987 sampling period.

2. Contamination from the flume head slowly moved into the flume and appeared at concentrations of a few parts per million in 1988.

3. The PCBs in the flume head have decreased somewhat in two years due to rains.

4. The PCBs in the sediments of the flume near the tidegates have decreased. Three mechanisms are responsible: a) rainwater washing, b) reworking and washing of sediments by tidal action, and c) deposition of clean fill sand from Boeing landscape projects on the flume banks.

A logical hypothesis that arises from the above interpretation is that if the sediments in the flume head were removed, then the flume would purge itself of sediments containing traces of PCBs. Raven would recommend cleaning the flume head unless other construction plans would make the cleaning unnecessary.

The wood core sample collection was begun in 1984 (Work Order #84-6). A sample one-foot upstream of the tide gates contained 1.7 ppm Aroclor 1242. A sample downstream of Myrtle St. contained <0.1 ppm. All the recent wood core data are presented in Table I and are at concentrations below a few parts per million. The presence of PCBs in the wood planks may be regarded as more permanent contamination. Washing by rainwater and tidewater would

have much less effect on PCBs inside the planks than on PCBs in the sediments.

SEATTLE CITY LIGHT WORK ORDER #89-6

1989 WINTER MONITORING OF THE GEORGETOWN FLUME

SAMPLE LISTINGS

TABLE I

Sample #/ # Subsample	Location	PCB Concentration (ppm) Spring	PCB Concentration (ppm) Autumn	PCB Concentration (ppm) Winter
GS-1[1] /2	Flume head	28	10.0	9.6
GS-2 /1	Double pipe head	26	1.8	5.8
GS-3 /4	Above tidegates	<1.0	0.3	0.8
GS-4 /4	Below tidegates	<1.0	<0.1	0.4
GS-5 /2	Willow St. Bridge	<1.0	<0.1	0.2
GS-6[2] /1	Myrtle St. Culvert	<1.0	----	----
GS-6[2] /wood	Above Willow St. Bridge	----	0.2	----
GS-7 /wood	Myrtle St.	<2.0	----	----
GS-7 /wood	Above Willow St. Bridge	----	<0.1	----
GS-8 /wood	Below tidegates	----	----	<0.1
GS-9 /wood	Below tidegates	----	----	1.4

[1] The samples are reported as Aroclor 1254. The detection limit for the other Aroclors was 0.05 ppm for the autumn and winter analyses.

[2] The sample number GS-6 is no longer used for Myrtle Street bridge sediments.

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SEATTLE CITY LIGHT WORK ORDER #89-6

1989 WINTER MONITORING OF THE GEORGETOWN FLUME

SAMPLE DESCRIPTIONS

TABLE II

Sample #/ # Subsample	Location	Description
GS-1 /2	Flume head	2" deep sediments under 10" of standing water settled clear. No oil sheen. The first inch was decayed grass in mossy yellow-brown sand. The second inch was oily black sand/silt with odors of hydrogen sulfide. Healthy grass near tunnel mouth.
GS-2 /1	Double pipe	1-1/2" deep sediments in shallow pools and patches of stagnant water. Silt with grayish black color and decayed leaves therein.
GS-3 /4	Above tide gate	1" channeled sediments in <1" standing water, patches of bare wood exposed. 1. Fine tan sand with black mud below. 2. Brown silty sand from fill area above flume. 3. Grass/-sand/silt. 4. Silt with healthy grass under clear water.
GS-4 /4	Below tide gate	Bare boards until 15' down-stream of the tide gate. 1,2. 1/4" deep damp sediments of coarse sand and black silt. 3,4. 1/2" deep oily silt and leaf debris.
GS-5 /2	Willow St. Bridge	3/4" black sand topped with yellow-brown silt and humus. The eastern sample had fresh sand from recent landscaping on the banks and some moss-covered rocks.
GS-8 /wood	Below tidegates	Deteriorated gray wood plank with sound fibers below the surface.
GS-9 /wood	Below tidegates	Solid planks

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SEATTLE CITY LIGHT WORK ORDER #89-6
1989 MONITORING OF THE GEORGETOWN FLUME

COMBINED SEDIMENT DATA

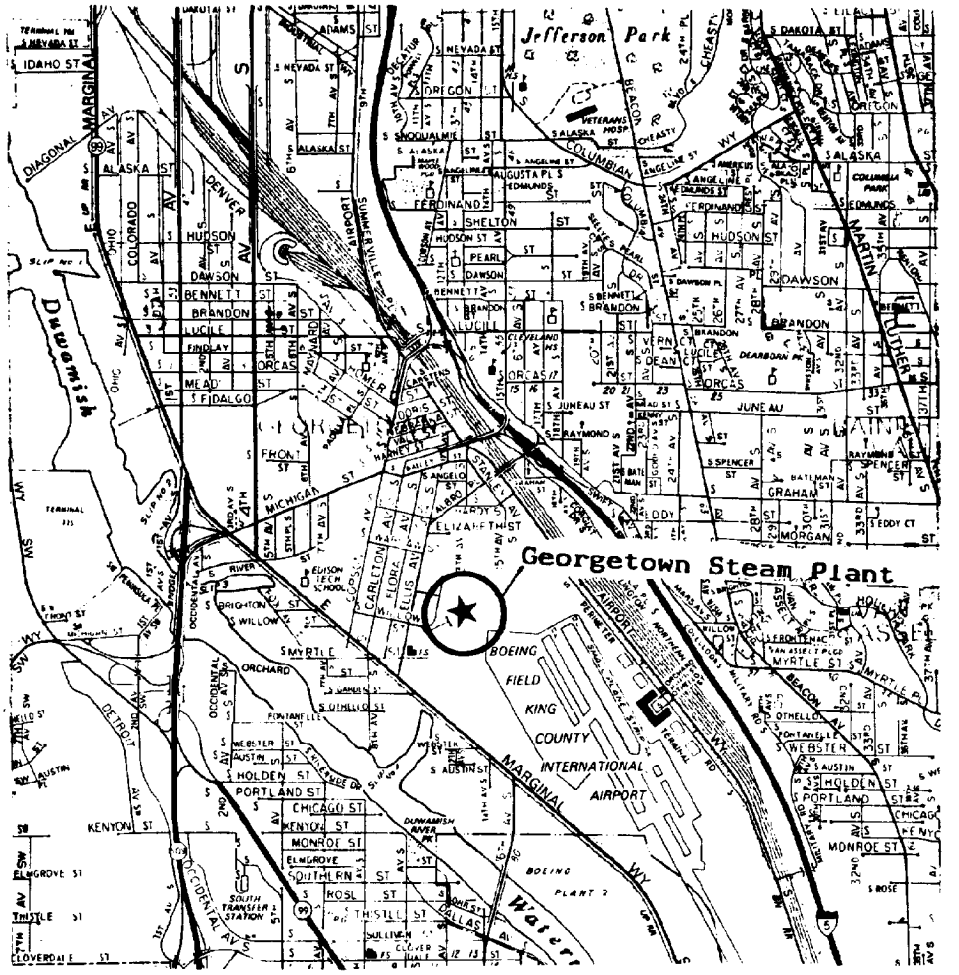
TABLE III

Sample #/ # Subsample	Location	PCB Concentration (ppm)* 1987	PCB Concentration (ppm)* 1988	PCB Concentration (ppm) Spring 1989	Autumn 1989	Winter 1989
GS-1 / 2	Flume head	123	14.26	28.0	10.0	9.6
GS-2 / 1	Double pipe head	----	2.23	26.0	1.8	5.8
GS-3 / 4	Above tidegates	10.4	2.17	<1.0	0.3	0.8
GS-4 / 4	Below tidegates	2.3	1.94	<1.0	<0.1	0.4
GS-5 / 2	Willow St. Bridge	----	0.25	<1.0	<0.1	0.2
GS-6 / 1	Myrtle St. Culvert	<1.0**	0.26			

* All signals registered the signature of Aroclor 1260.
** Four subsamples were composited in 1987.

NOTE: All 1988 samples were reported as major Aroclor 1260 in Work Order #88-12.
The 1987 samples were reported as major Aroclor 1254 in Work Order #87-5.
All 1989 samples were reported as major Aroclor 1254.

GEORGETOWN STEAM PLANT
VICINITY MAP



RAVEN SERVICES CORPORATION		
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DATE: 6-27-90		REVISED
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SEATTLE CITY LIGHT		DRAWING NUMBER -6-1

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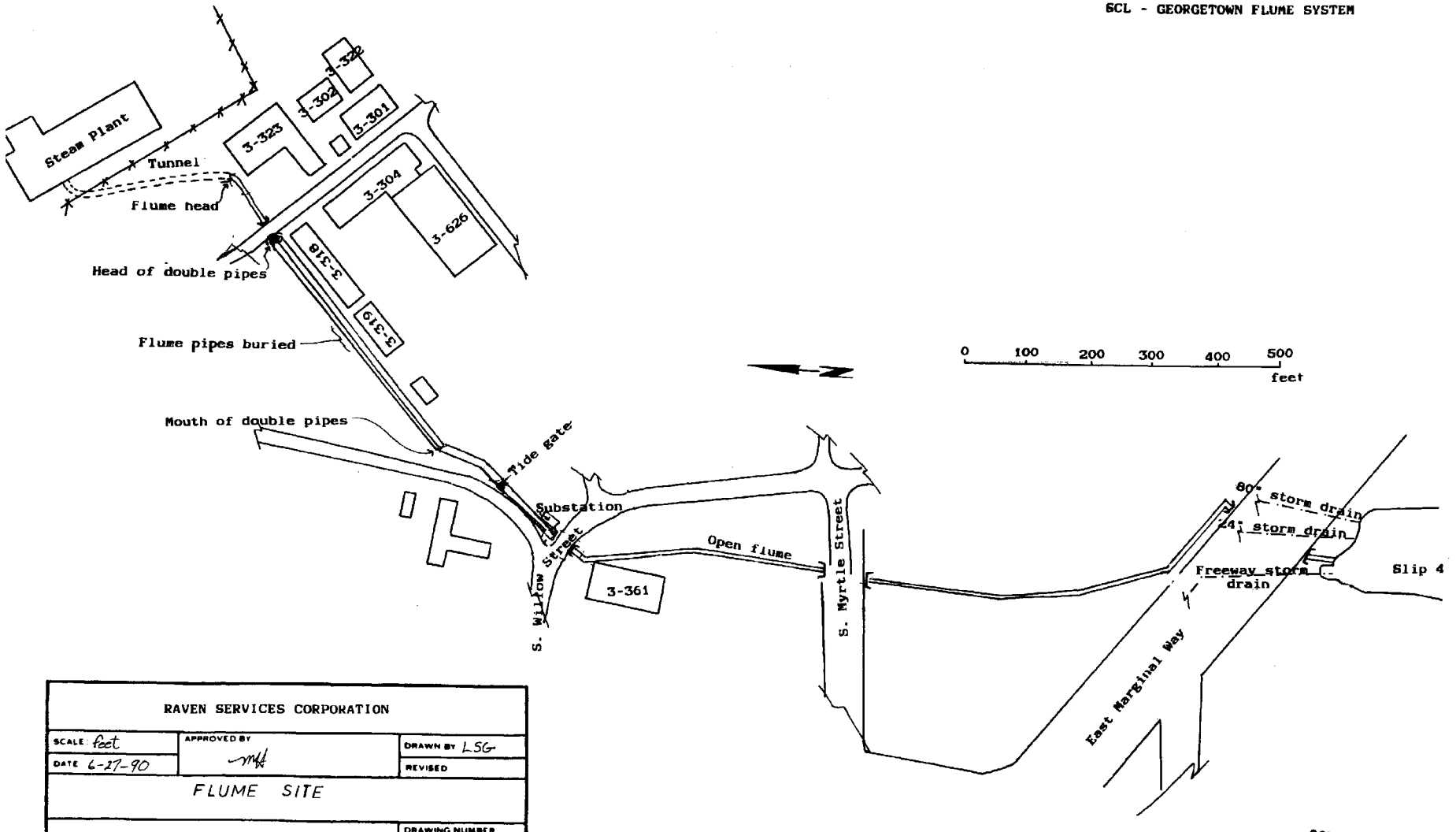
SCL - GEORGETOWN FLUME SYSTEM



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RAVEN SERVICES CORP.		
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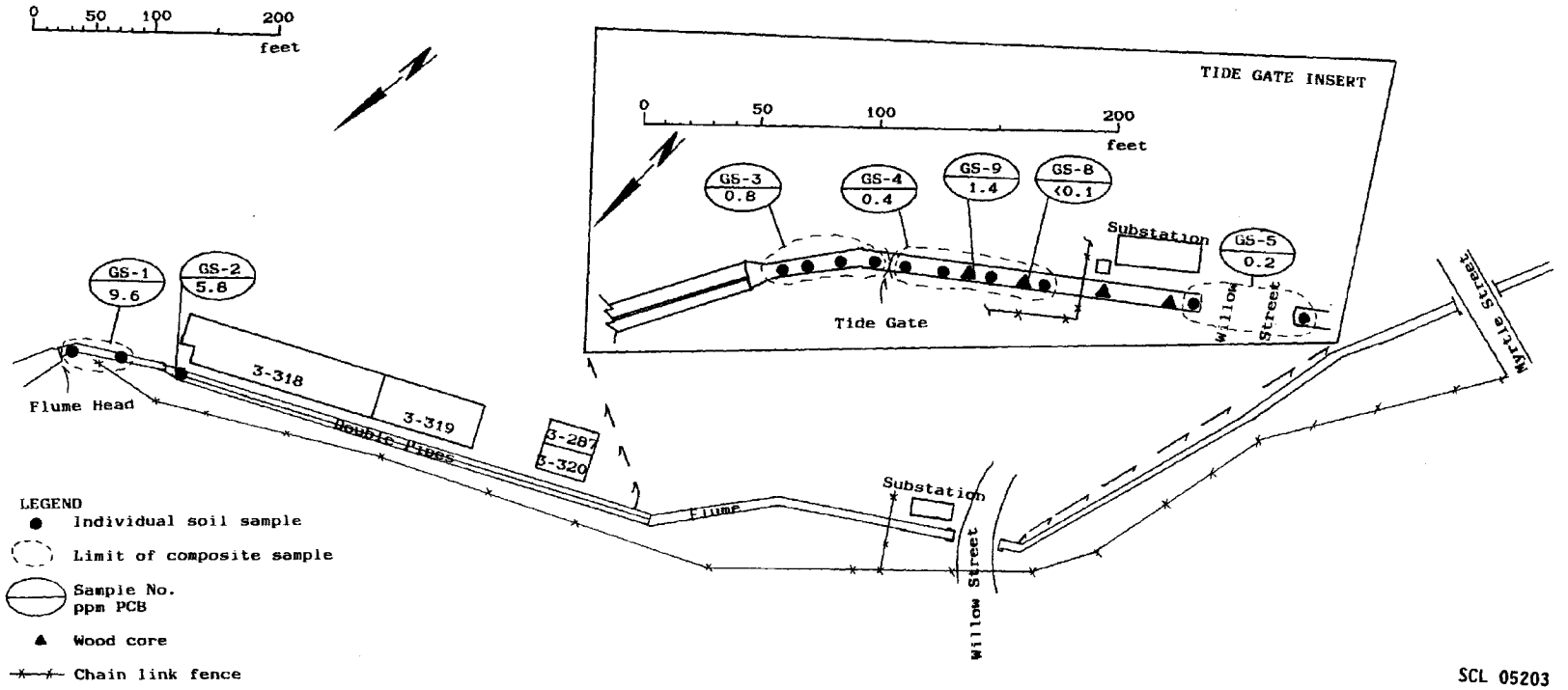
SCL GEORGETOWN FLUME SYSTEM
WINTER TESTING - 1989



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